

**Data Link Security**  
for  
**Airline Operational Communications**  
and  
**Air Traffic Services**

***An Opportunity for Synergistic Efforts***

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# Synergistic Opportunities

- **Key Management Policy and Implementation**
  - A common solution for:
    - ◆ ATN Security
    - ◆ ACARS Security
- **ACARS Security**
  - A common solution for:
    - ◆ Airline Operational Communications (AOC)
    - ◆ Air Traffic Services (ATS)
      - Future Air Navigation Systems (FANS)
      - Pre-Departure Clearance (PDC)

# **What is Driving the Need for Data Link Security?**

# ICAO Analysis Applicable to Data Link Security

**“Air traffic control messages (via data link) are **at risk from Modification, Replay and Masquerade attacks.****

**All CNS/ATM applications are **vulnerable to Denial of Service attacks.**”**



## ◆ ICAO ATNP Security Working Group

- Overall Security Concept
- ATN Panel Working Group 1, August 1996
- Marshall Abrams, Mitre

# US Policy Applicable to Data Link Security

**“The information technology revolution has changed the way business is transacted, government operates, and national defense is conducted.**

**Protection of these systems is essential to the telecommunications, energy, financial services, manufacturing, water, transportation, health care, and emergency services sectors.”**



## ◆ Critical Infrastructure Protection in the Information Age

- Executive Order 13231
- The White House, Washington
- October 16, 2001

# US Policy Applicable to Data Link Security

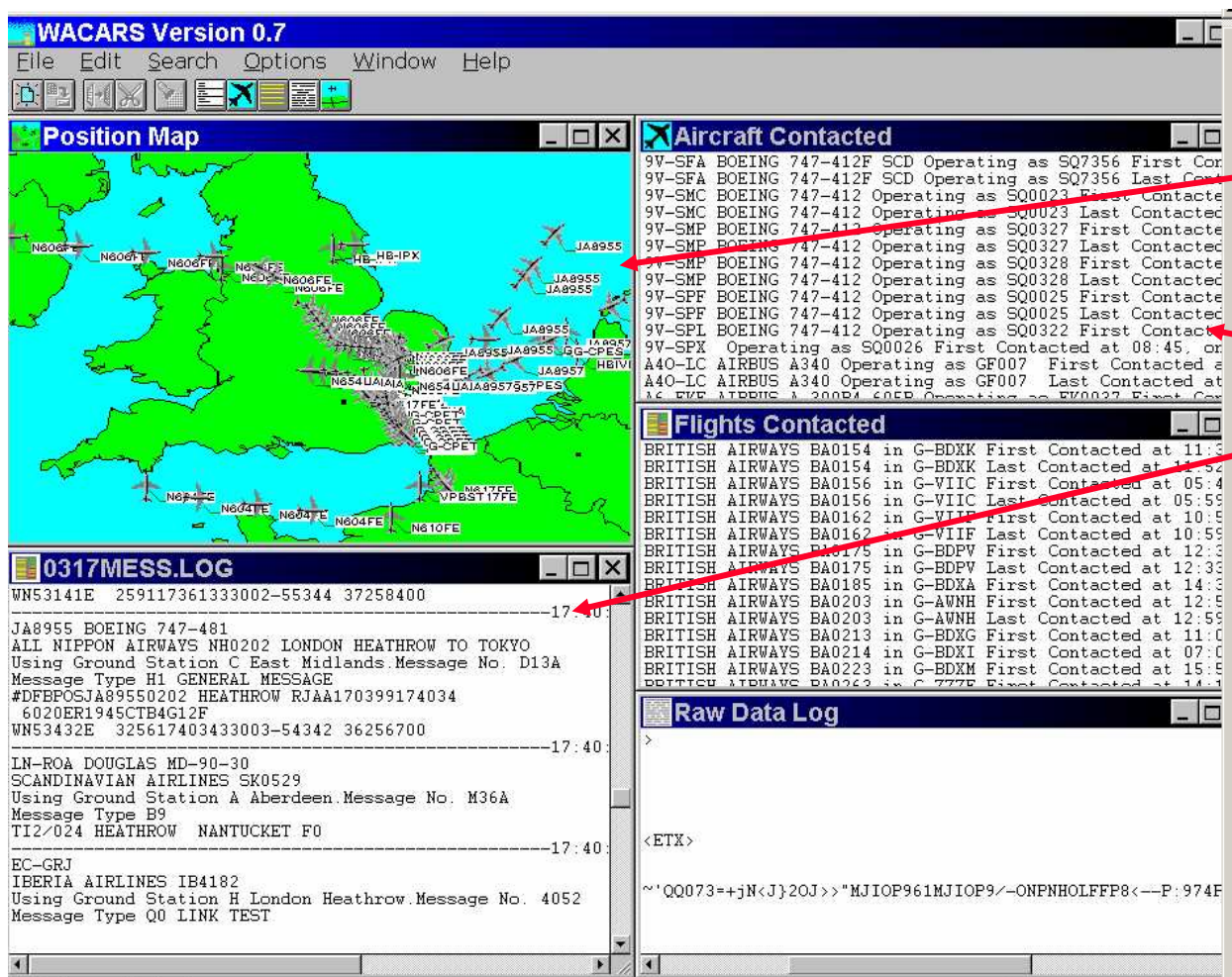
**“Federal agencies should consider installing systems that continuously **check for unauthorized connections to their networks.****

**... including strong encryption, bi-directional authentication ...”**



- ◆ **The National Strategy to Secure Cyberspace**
  - The White House, Washington
  - Actions and Recommendations 4-3
  - February 2003

# ACARS Monitoring



## What's Disclosed?

Graphical Position Reports

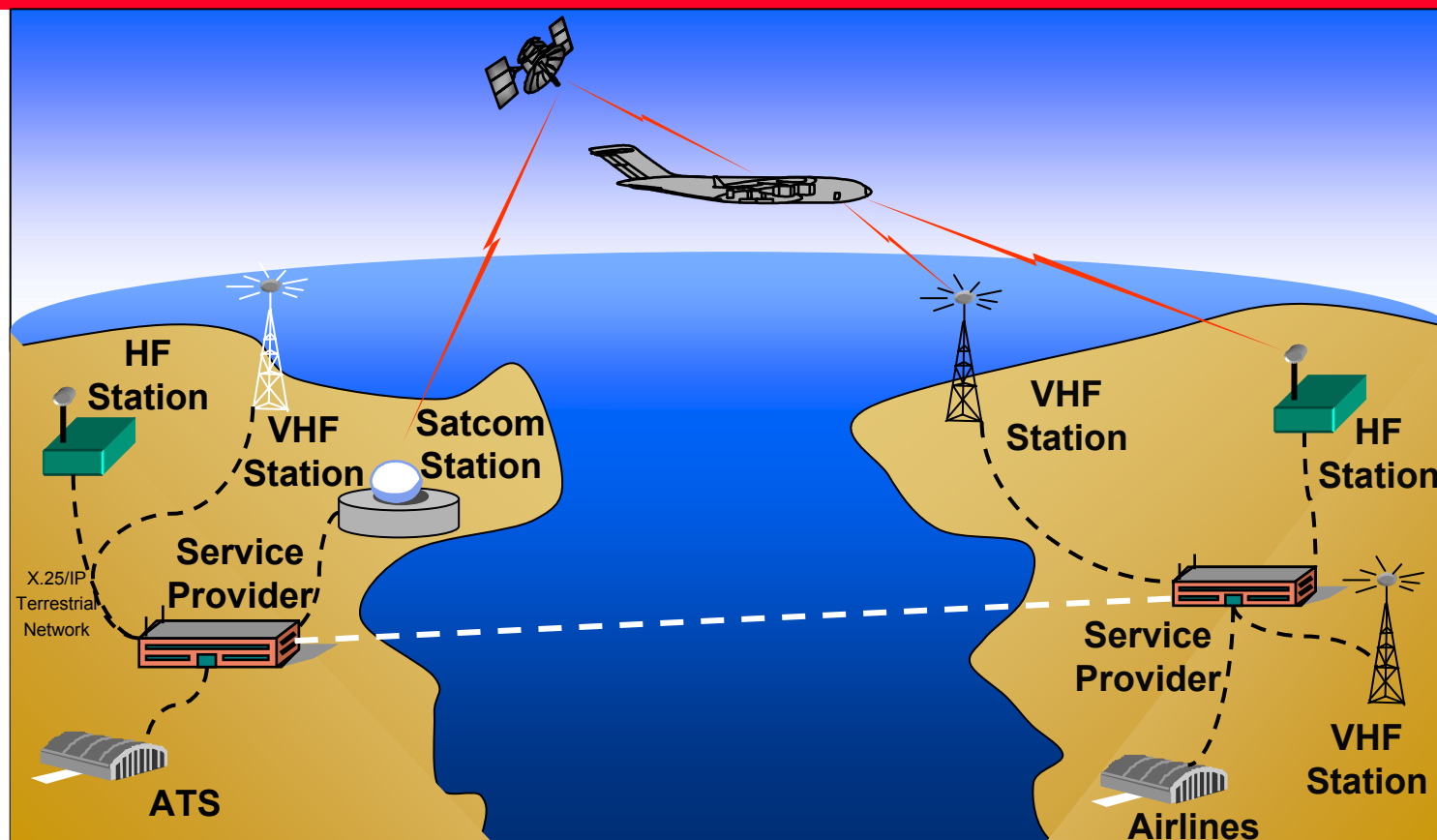
Contact Reports

Detailed Message Logs

*All that is Needed –  
A Personal Computer,  
Soundcard,  
RF Scanner and  
Readily Available  
Freeware*

*There is only a small step between monitoring and masquerading*

# ACARS – Current Operations



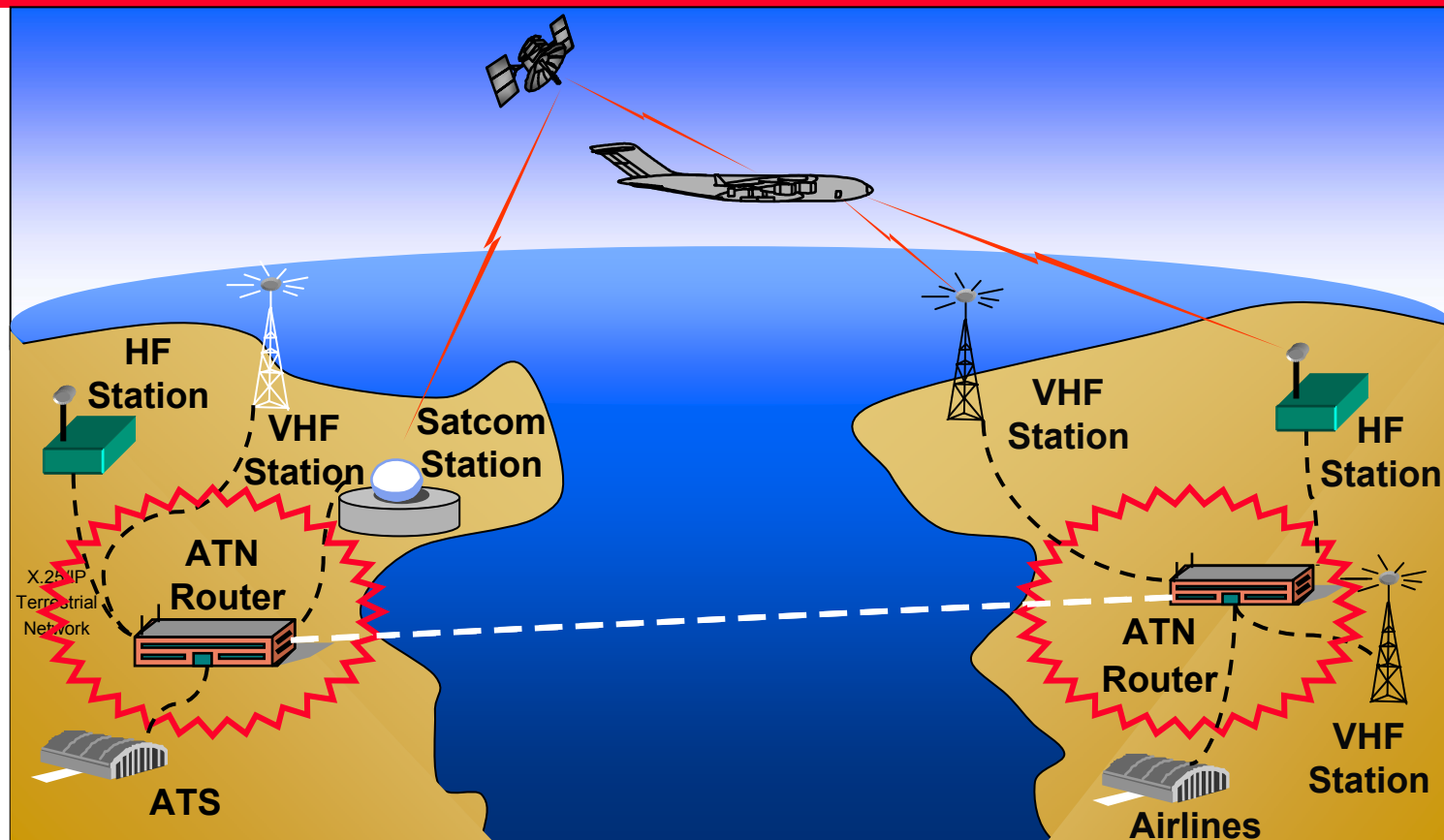
- Future Air Navigation Systems (FANS)

- Airline Operations Communications (AOC)

*Many unprotected data links and systems!*



# ATN – Current Operations



- **Aeronautical Telecommunications Network**

***ATN Routers unprotected in current ATN roll-out!***

# **What is the Current Status of Data Link Security Solutions?**

# Mitigation Concepts



- **ATN**

- **Primary Objective**

- ◆ **ATS Data Authentication and Integrity**
    - ◆ **Edition 3 of ICAO Document 9705 - 2002**

- **Implementation Schedule**

- ◆ **Awaiting FAA/CAA Guidance on Policy and Implementation Schedules**

- **ACARS**

- **Primary Objective**

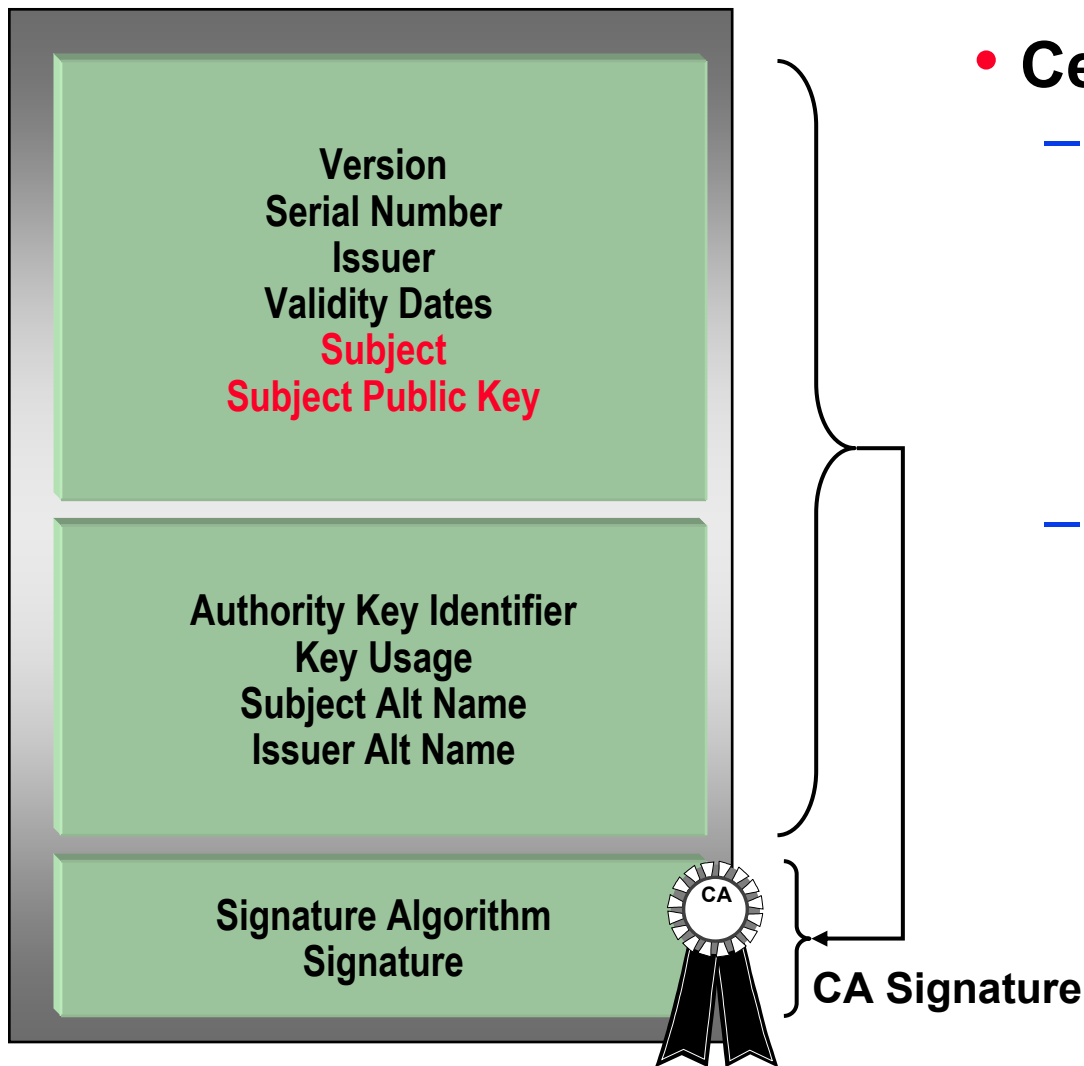
- ◆ **Commercial Information Assurance Solutions available to protect AOC data**
    - ◆ **Easily adapted to authenticate and provide integrity for ATS messages**

- **Implementation Schedule**

- ◆ **Some airlines going forward with AOC encryption**
    - ◆ **AEEC would welcome FAA/CAA involvement on ATS policy and schedules**



# Certificate Details



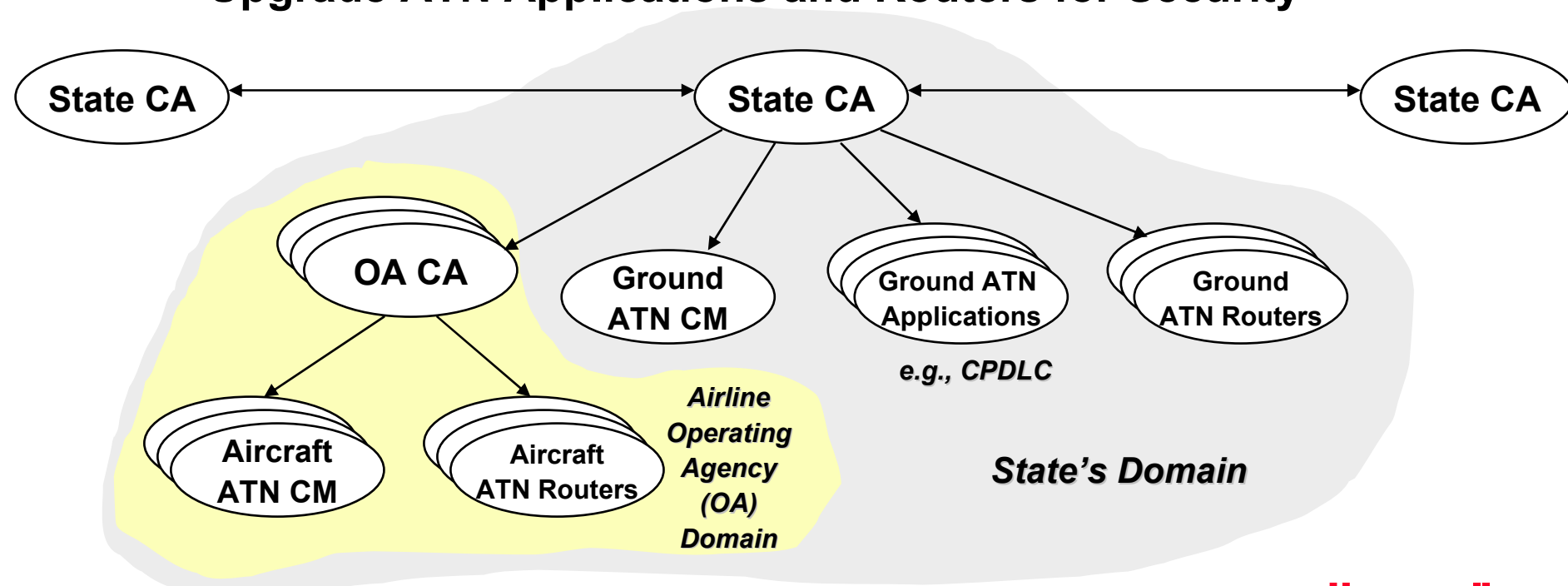
- **Certificates**

- Bind Two Public Pieces of Information
  - Subject (Name)
  - Subject Public Key
- Signed by a Trusted Source
  - Certificate Authority
  - Public Signing Key of Certificate Authority Distributed in a Trusted Manner to All Users

# Technology Tasks Remaining

- **ATN Security**

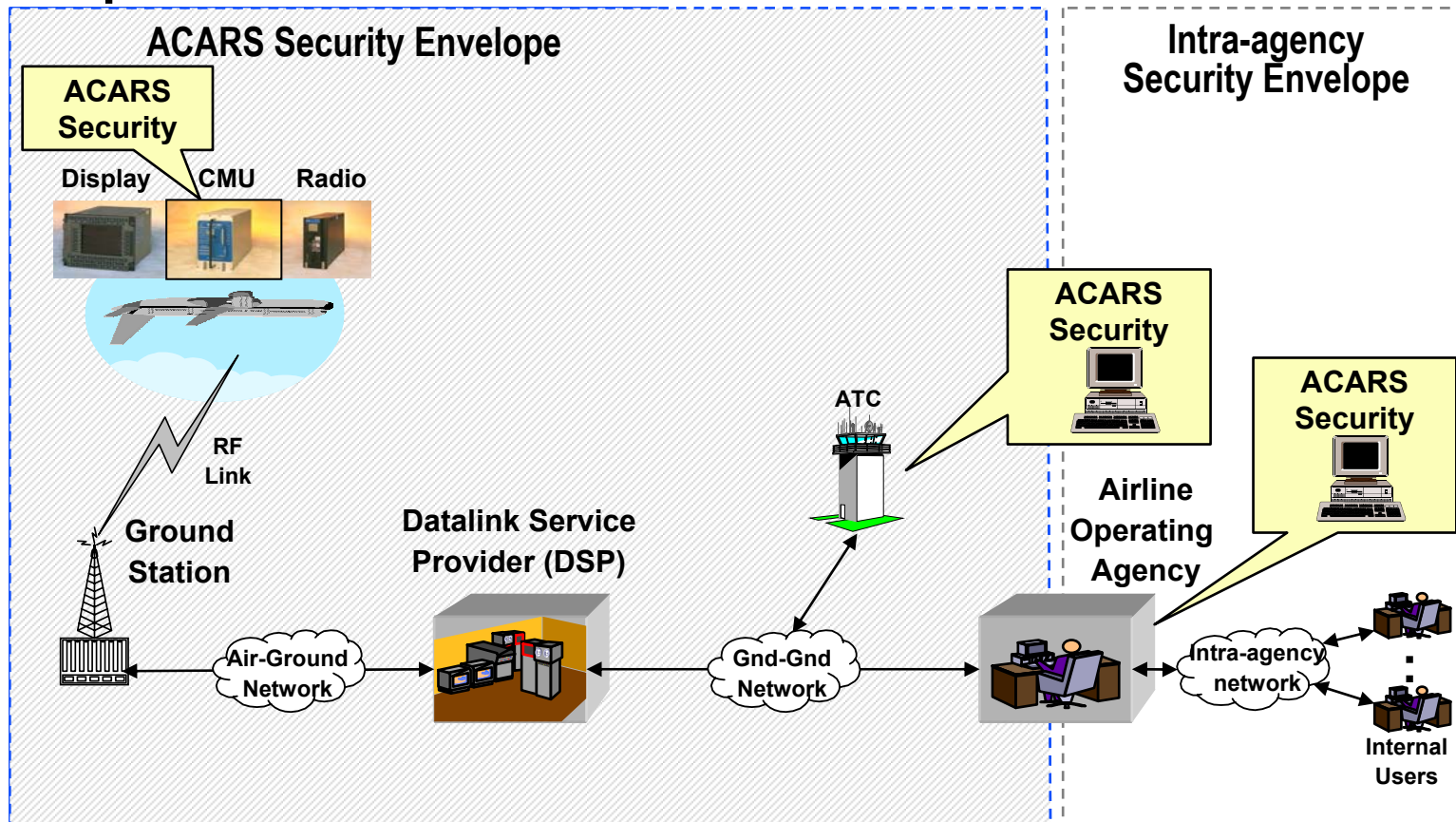
- CAA Key Management and Cross Certification
- AEEC Key Management
  - ◆ Avionics Key Management
  - ◆ State to Airline Certificate Authority Infrastructure
- Upgrade ATN Applications and Routers for Security



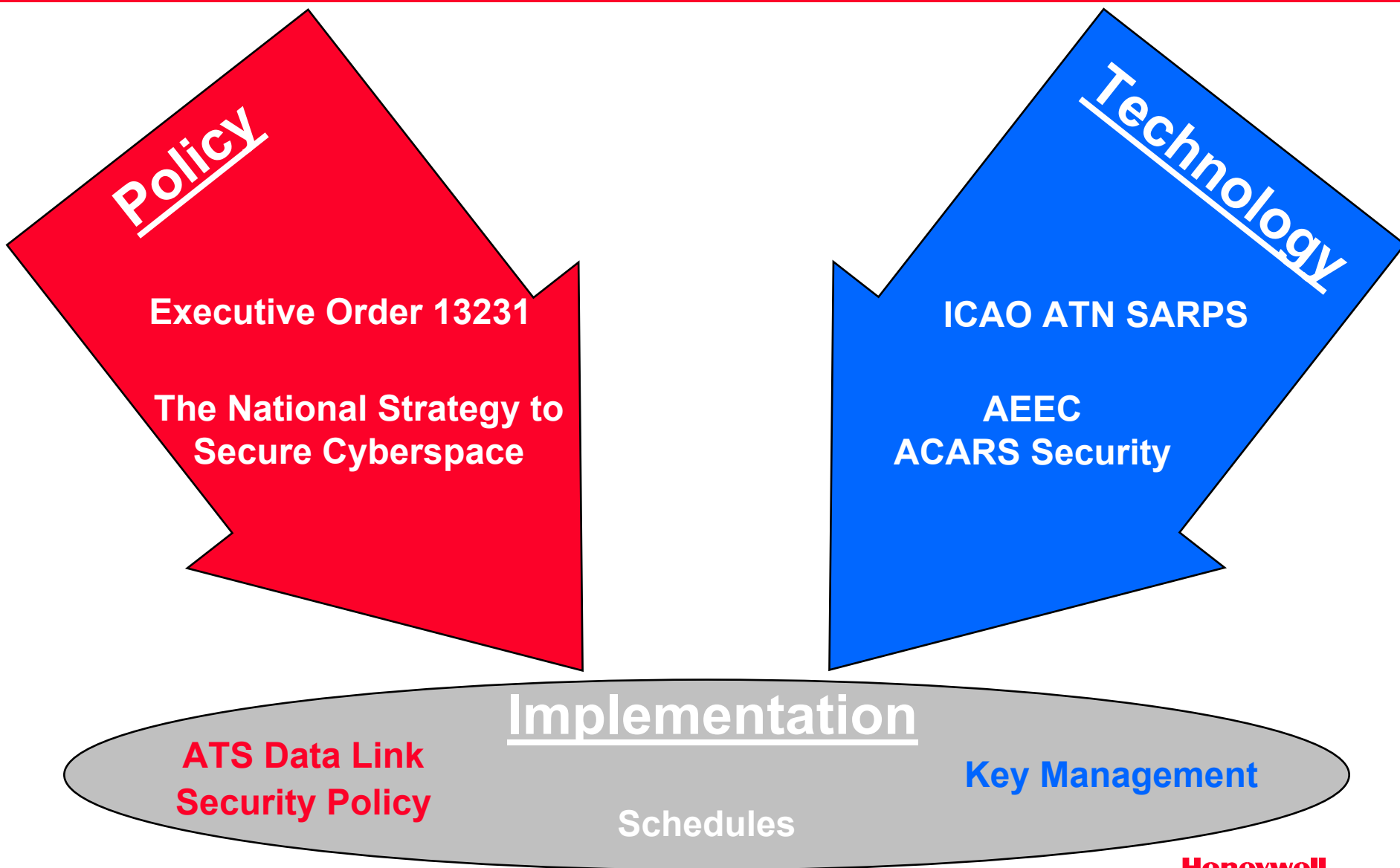
# Technology Tasks Remaining

## ACARS Security

- FAA/CAAs Participation welcomed in AEEC Data Link System Subcommittee Security Initiative if there is a requirement for ACARS ATS Information Assurance



# Policy – Technology – Implementation Roadmap



# Standards Bodies Activities

- **ICAO Aeronautical Mobile Communications Panel**
  - **Working Group N - ATN**
    - ◆ **Encryption for ATN**
    - ◆ **Sunset Date Beyond Which Non-Secure ATN Operations are Not Permitted**
- **AEEC**
  - **Data Link Systems Subcommittee**
    - ◆ **Key Management Concept for ATN**
    - ◆ **ACARS Security for AOC and potentially ATS**
    - ◆ **Meeting Announcements**  
[http://www.arinc.com/aeec/projects/dlk\\_systems/](http://www.arinc.com/aeec/projects/dlk_systems/)

***FAA / CAA Involvement is Vital to Achieve Synergistic Opportunities***



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